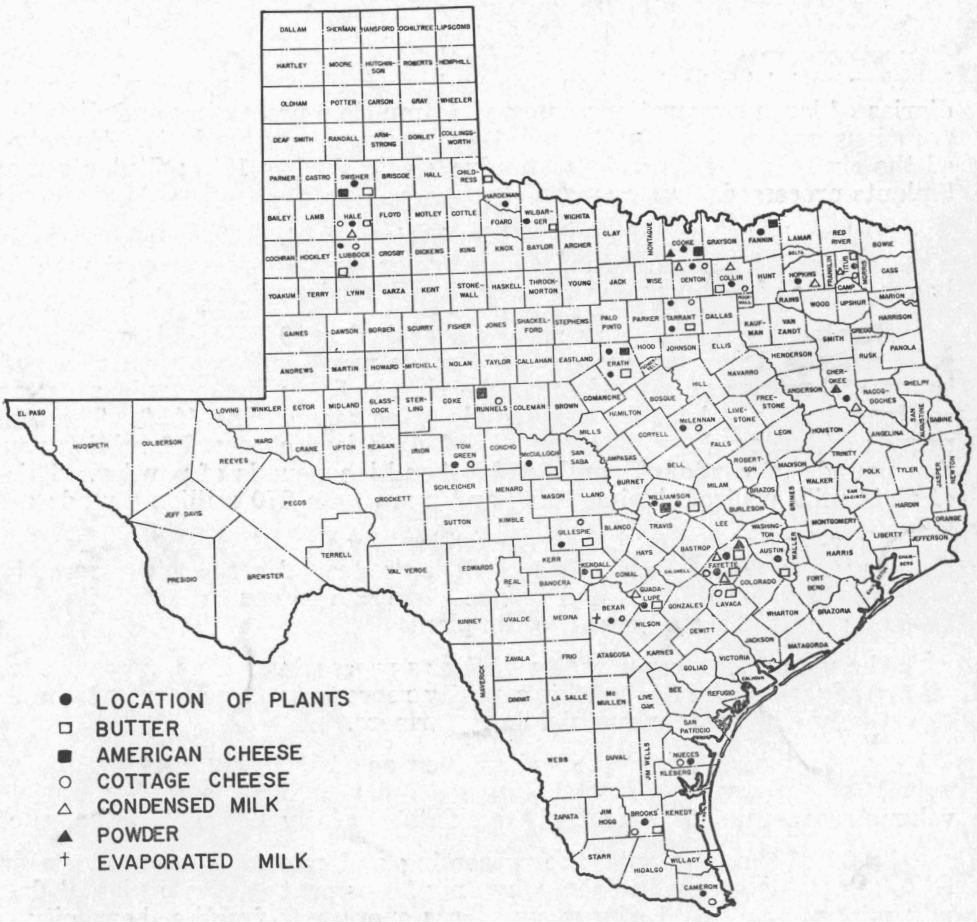
BULLETIN 883



# Economics of Milk Products Processing Plants in Texas




Location of milk products manufacturing plants in Texas, by types of product, summer 1957.

DECEMBER 1957

TEXAS AGRICULTURAL EXPERIMENT STATION

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# Summary

The 12,800 Texas farmers selling milk during 1957 marketed an estimated 260 million gallons of milk having a farm value of 115 million dollars and a retail value of more than 230 million dollars. The average Texas dairy producer sold about seven times more milk in 1957 than in 1944 and almost five times more than in 1949.

Almost half of the Texas farm families now purchase the milk they consume, as compared with less than 10 percent during 1940.

The trend among dairy farmers in Texas has been toward greater specialization in producing for the wholesale fluid milk market. Farm production and sale of butter, cream and other milk products have been replaced by the sale of fluid milk to milk handlers and processors.

Data on production of manufactured products for 1957 represent estimates of plant managers and are based on actual output up to the time of interview (summer 1957) and anticipated production for the remainder of the year.

Twenty-one of the 34 plants surveyed are under corporate ownership, 5 are owned by milk producers' cooperatives, 4 are under individual ownership and 4 are partnerships. Twenty-one plants engage in other activities besides handling and processing milk and milk products. Nine of these are subsidiaries of large corporations engaged in multiple processing and distribution operations and 3 are corporations engaged in handling and processing other products. Twenty-two plants processed only one of the six manufactured dairy products sold during 1957; 7 plants manufactured two products; and 5 plants processed three or more.

Although the average age of the basic plant buildings is 21 years, and ranges from 1 to 48, every plant except 1 has received major repairs or replacements of equipment. In general, plants are in a fairly good state of repair and are equipped with modern facilities.

Nineteen of the 34 plants made butter during 1956-57; 14 made cottage cheese; 9 made condensed milk, 6 made American cheese and 4 made powder. These plants manufactured 4.4 million pounds of butter, 2.8 million pounds of American cheese, 5.6 million pounds of cottage cheese, 7.7 million pounds of condensed milk and 3.8 million pounds of powder during 1956. The estimate for 1957 was 5.1 million pounds of butter, 3.9 million pounds of American cheese, 7.1 million pounds of cottage cheese, 8.6 million pounds of condensed milk and 4.4 million pounds of powder. This represents 227 million pounds of fluid milk utilized during 1956, and more than 270 million pounds estimated for 1957.

Fifty-four percent of the milk utilized by the 34 plants was received directly from producers living near the plant. Other sources include producers' associations, receiving stations and other plants and milk handlers. Most processed products are sold to consumers or distributors located in centers of population or rural areas adjacent to the plant.

The manufacturing capacity of Texas processing plants appears adequate to handle all the surplus milk produced in the State. This capacity represents 31 percent of the 9.9 million pounds of milk produced daily by Texas commercial dairy farmers.

Although the plants operated an average of 51 hours per week, they processed only 1.6 million pounds of fluid milk into manufactured dairy products per day during the summer of 1957. This volume represents 49 percent of the plants' capacity based on 48 hours of operation.

In 23 of the 34 plants, the processing and sale of dairy products are incidental to fluid milk distribution. This partly explains why only 24 percent of these plants' daily milk receipts are processed into milk products and why many plants operate at fractional capacity. Use of processing facilities on a year-round basis could be improved by greater uniformity and less seasonal variation in manufacturing milk supplies.

The increased use of a bulk transportation system makes possible the rapid movement of fluid milk from surplus to deficit areas of the State.

Some interested state-wide organization possibly would render great benefits if it could obtain, coordinate, and release daily information on which areas in the State have surplus milk and which plants or handlers are in short supply.

# Economics of Milk Products Processing Plants in Texas

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THE 1954 CENSUS OF AGRICULTURE SHOWS THAT commercial dairying was established in 248 of Texas' 254 counties. In 1944 there were 42,000 commercial dairies reported in Texas, in 1949 there were 22,000 and in 1954 there were 14,000. In the fall of 1957 approximately 12,800 Texas farmers were selling milk. This estimate is based on county agricultural agents' reports of Grade "A" dairies in Texas and on the fact that in 113 counties, for which accurate data are available, the number of farmers selling Grade "A" milk during the summer of 1957 was only 83 percent of the number during 1954. While the number of farms classified as dairy farms decreased 33 percent during 1944-54, the amount of milk sold by Texas dairy farmers increased from 168.3 to 204.4 million gallons during that same period.

According to census definition, a farm is classified as a dairy farm if the value of the sales of dairy products represents 50 percent or more of the total value of the farm products sold or if (1) milk and milk products account for 30 percent or more of the total value of products sold, and (2) milk cows represent 50 percent or more of all cows and (3) the sale of milk and milk products plus the sale of cattle represent 50 percent or more of the total value of farm products sold.

It is estimated that the 12,800 Texas farmers selling milk marketed over 260 million gallons of fluid milk during 1957 with a farm value of 115 million dollars. This includes the sales by some 4,200 ungraded producers who were selling milk to dairy products processing plants. The retail value of this milk amounted to about 225 million dollars. The average Texas dairy producer selling milk during 1957 marketed about seven times more milk than the average producer during 1944 and almost five times more than in 1949. Daily sales of producers averaged 95 pounds during 1944 and 172 pounds during 1949. Daily sales per producer of 504 pounds during 1954 increased to about 714 pounds during 1957. This indicates a trend in two areas: smaller than average producers are going out of the dairy business for the most part and those remaining in production are increasing the volume of milk marketed on the average.

## Recent Changes in Dairying in Texas

Despite the series of dry years over most of the State, the development of dairying has made great strides. This development resulted partly from the response of dairymen to supply the fluid milk needs of an increased urban population and from the tendency of most milk producers to specialize in dairying instead of using it as a sideline to cotton or other cash crops.

Some of the more pronounced changes in the Texas dairying industry since 1940 are presented in Tables 1 and 2. The number of milk cows on farms declined from 1.3 million in 1940 to 729,000 at present. Annual production per cow increased from 3,200 pounds of milk during 1940 to 4,320 pounds during 1957 while total production of milk in Texas decreased from 4.2 billion pounds to 3.1 billion pounds during this period. The 35 percent increase in milk production per cow was more than offset by the 45 percent decrease in the number of milk cows on Texas farms.

During 1940 milk cows were found on 93 percent of the farms, but in 1954 only 55 percent

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TABLE 1. CHARACTERISTICS OF THE DAIRY INDUSTRY IN TEXAS, 1940-57[1]

| Item | 1940 | 1944 | 1949 | 1954 | 1957 |
|---|---|---|---|---|---|
| | | | | | Estimated |
| Farms reporting milk cows | 338,081 | 320,107 | 229,870 | 161,296 | |
| Number of dairy farms | 10,421 | 11,867 | 9,593 | 8,378 | 8,300 |
| Number milk cows on farms, 1,000 | 1,310 | 1,392 | 1,010 | 812 | 729 |
| Yearly milk production per cow, pounds | 3,200 | 3,030 | 3,270 | 3,750 | 4,320 |
| Total milk production on farms, million pounds | 4,192 | 4,218 | 3,303 | 3,045 | 3,140 |
| Milk consumed on farms, million pounds | 1,007 | 966 | 669 | 446 | 365 |
| Butter churned on farms, 1,000 pounds | 41,000 | 33,000 | 23,500 | 11,000 | 9,500 |
| Milk retailed by farmers, million pounds | 310 | 300 | 220 | 150 | 118 |
| Cream sold to plants and dealers by farmers, million pounds | 1,010 | 733 | 238 | 88 | 55 |
| No. farmers selling cream | 71,877 | 55,618 | 24,041 | 9,278 | 4,500 |
| Value of cream sold, $1,000 | 10,840 | 14,602 | 3,433 | 1,388 | 868 |
| Whole milk sold to plants and dealers by farmers, million pounds | 1,084 | 1,448 | 1,372 | 1,758 | 2,250 |
| No. farmers selling milk | 36,230 | 42,219 | 22,235 | 14,128 | 12,800 |
| Farm value of whole milk sold, $1,000 | 34,425 | 66,121 | 79,718 | 89,932 | 115,113 |
| Daily average sales per producer, pounds | 82 | 95 | 172 | 504 | 714 |
| Value of milk sales per farm, dollars | 950 | 1,574 | 3,623 | 6,420 | 9,000 |
| Farm value of sales of milk and milk products, $1,000 | 48,445 | 89,810 | 122,659 | 130,849 | 138,000 |
| Value of products consumed on farms, $1,000 | 31,835 | 50,193 | 57,713 | 37,092 | 31,600 |
| Gross farm income from dairy products, $1,000 | 80,280 | 140,003 | 180,372 | 167,941 | 169,600 |
| Deflated values of[2] | | | | | |
| Cream sold by farmers, $1,000 | 10,948 | 10,070 | 2,738 | 815 | |
| Whole milk sold by farmers, $1,000 | 34,753 | 45,601 | 39,859 | 40,148 | 50,488 |
| Milk sales per farmer, dollars | 960 | 1,086 | 1,812 | 2,866 | 4,047 |
| Farm sales of milk and milk products, $1,000 | 48,929 | 61,938 | 61,333 | 58,411 | |
| Products consumed on farms, $1,000 | 32,153 | 34,616 | 28,856 | 16,558 | |
| Gross farm income from dairy products, $1,000 | 81,083 | 96,554 | 90,186 | 74,969 | |

[1]Sources: "Milk, Farm Production, Disposition and Income" U. S. Department of Agriculture, Agricultural Marketing Service, Crop Reporting Board, Washington, D.C.; U. S. Department of Commerce, Bureau of the Census, U. S. Census of Agriculture, Washington, D. C.

[2]Deflated by index of prices paid by farmers, 1935-39=100.

of farmers reported owning milk cows. One-half of Texas farm families now are purchasing the milk they consume. While the total number of farms in the State decreased 30 percent, the number of farm families having milk cows decreased 52 percent during that period.

As dairy farmers have moved toward more specialization in production of fluid milk for sale to commercial milk handlers, they have dropped many of their previous retail fluid milk sale and milk product processing and sale functions. For example, in 1940 the yearly farm production of butter, decreased from 41 million pounds, utilizing 800 million pounds of fluid milk, to 11 million pounds in 1954 utilizing 227 million pounds of milk. Sale of fluid milk at retail by farmers decreased from 310 million pounds during 1940 and 150 million pounds during 1954; the sale of milk equivalent in the form of cream and butter declined from 1,676 million pounds to 88 million pounds during that period. During this same 15-year period total consumption of fluid milk on Texas farms decreased from 1,700 million pounds to 717 million.

The sale of fluid milk at wholesale by farmers increased from 1,006 million pounds in 1940 to an estimated 2,250 million pounds during 1957, but the total sales of milk and equivalent remained about the same from 1940 (2,492 million pounds) to 1954 (2,328 million pounds), Figure 1.

During 1940 only 24 percent of the total milk produced on farms was sold by farmers as fluid milk; this figure has increased to 71 percent.

TABLE 2. CHANGES IN MILK PRODUCTION AND SALES BY TEXAS FARMERS, 1940 AND 1957

| Item | 1940 | 1957 | Percent change |
|---|---|---|---|
| Total production of fluid milk, million pounds | 4,192 | 3,140 | −25 |
| Sales of milk and equivalent to dealers, million pounds | 1,006 | 2,382 | +137 |
| Percent of total sales | 40 | 93 | |
| Sales of milk and equivalent at retail by farmers, million pounds | 1,486 | 173 | −88 |
| Percent of total sales | 60 | 7 | |
| Total sales, million pounds | 2,492 | 2,555 | +3 |
| Percent of production | 59 | 81 | |
| Consumption on farms, million pounds | 1,700 | 585 | −66 |
| Percent of production | 41 | 19 | |
| Daily sales of fluid milk per farm, pounds | 82 | 714 | +790 |

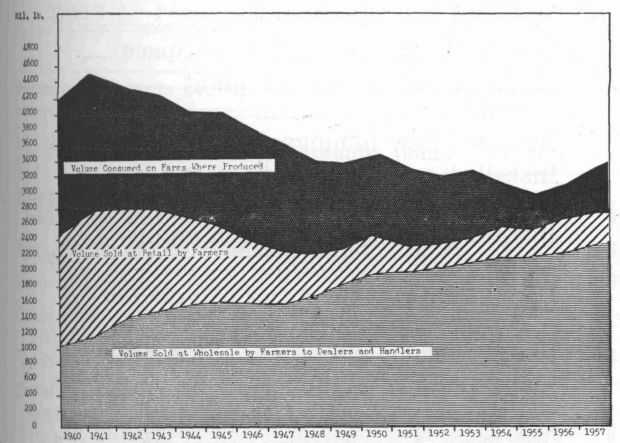


**Figure 1. Disposition of milk produced by Texas farmers, 1940-57. Source: "Milk, Farm Production, Disposition and Income," USDA, AMS, Crop Reporting Board, Washington, D. C.**

## Purposes of the Study

This study was undertaken to furnish the dairy industry information considered essential in establishing economically located and efficiently operated dairy products processing plants in Texas.

Farm production and sale of butter, cream and other milk products has been replaced by the sale of milk to milk dealers for processing. Dairy farmers have become increasingly dependent on processing plants and milk handlers for disposition of their output. In most areas of the State farmers produce more milk than is utilized as fluid, or Class I milk. In some areas 30 percent of the milk is utilized as Class II, or put to manufacturing use. This indicates that the total consumption of fluid milk in Texas has not kept up with increases in total sales by Texas dairy farmers. Although seasonal fluctuation in production has been decreasing recently, it has not been eliminated completely. The problem of excess production (fluid milk production in excess of the quantity consumed as fresh or fluid milk) continues to be acute during periods of flush production.

The depressing effect of production in excess of consumption requirements on the price producers receive for milk is probably greater with respect to milk than most other farm products; milk that is not consumed as fluid milk is processed into various milk products. In markets under Federal Marketing Orders, regulations stipulate minimum prices for milk used in Class I and Class II. In Texas markets during 1956, the Class I price averaged $5.90 per hundred pounds and the Class II price averaged $3.30, or only 56 percent of Class I price. Prices received by farmers, therefore, are affected vitally by the percentage of total producer milk used in processing milk products.

From the standpoint of quality there is no difference in that part of a Grade "A" producer's milk used in, and priced as, Class I and Class II. Some of the milk may have come from the same udder. This wide difference in price causes dairy farmers to strive for Class I use of as large a part of their total sales as possible. This price difference is the main cause of reduction in the number of Grade "B" and ungraded dairy farmers and volume of ungraded milk sales. It is the force behind every farmer's attempt to obtain Grade "A" rating and qualify for sale of Grade "A" milk at Class I prices.

Milk sales by Texas farmers probably will continue to exceed consumption of fluid milk in the State. If this trend continues it will become more important to the dairy industry that milk products processing plants be capable of efficiently using the "excess" milk.

## Method of Study

This information was obtained through personal interviews with the management personnel of 34 dairy products processing plants operating in Texas during the summer of 1957.

Personnel of these plants were the most reliable source of information needed in this study since they utilize in their processing the excess milk produced in Texas.

Production data for 1957 represent estimates of plant managers, and are based upon actual output up to the time of interview and anticipated production for the remainder of the year.

## Location and Number of Plants and Products Manufactured

The 34 manufacturing plants surveyed are located in 28 counties in the State (see map on cover). Most of the newer plants were built in connection with facilities for handling raw milk receiving and packaged milk distribution and were adjacent to areas of concentrated Grade "A" milk production and centers of consuming population. Processing equipment was installed subsequently in those plants to utilize excess milk as producer deliveries of Grade "A" milk increased.

As a rule the older plants were built adjacent to areas of ungraded milk production and, as originally designed, most were erected primarily for processing raw milk into milk products. However, as the volume of ungraded milk marketed solely for processing decreased, managers of these older plants have placed more emphasis on handling Grade "A" milk and less on processing ungraded milk. Thus, many of the older processing plants are no longer ideally located from the standpoint of sources of raw milk supplies and milk consumers. Improved transportation facilities and bulk handling, however, have decreased the importance of having raw milk supplies produced nearby and of being located immediately adjacent to large population centers.

Twenty-two of the 34 plants produced only one of the six manufactured dairy products dur-

ing 1956-57; 7 plants manufactured two products and 5 plants produced three or more products. No plant manufactured all five products.

In addition to the 34 plants surveyed, 2 cooperatively owned plants under construction in Bexar and Hopkins counties, scheduled for completion in 1957, will have a combined capacity of 88,000 pounds of condensed milk, 15,000 pounds of evaporated milk and 1,000 pounds of American cheese per 8-hour run.

Nineteen plants manufacured butter, 14 plants made cottage cheese, 6 made American cheese, 9 made condensed milk and 4 manufactured powdered milk.

## Type of Ownership

Twenty-one plants are under a corporate type of ownership, 5 are owned by milk producers' cooperatives, 4 are under individual ownership and 4 are partnerships.

Twenty-one of the 34 plants are engaged in other activities besides handling and processing fluid milk and milk products. Nine of these are subsidiary to large corporations engaged in multiple processing and distribution operations and 3 are corporations engaged in handling and processing other products—such as egg handling, feed and fertilizer manufacturing and poultry processing. Five plants belonging to milk producers' organizations engaged mainly in handling and processing milk and milk products, 1 engaged in chain grocery store operations, 1 in soft water service and a sheep ranch, 1 in orangeade and ice cream novelties and 1, under individual ownership, engaged in cattle ranching and general farming.

## Age of Plants, Major Repairs and General Conditions

The basic buildings of the oldest plant operating in Texas were built about 1909, while the newest plant was constructed in 1957. Although the average age of Texas plants is 21 years, milk products manufacturing plants in Texas cannot be considered obsolete. Six plants were built less than 10 years ago. Those 6 plants have a combined capacity per 8-hour run of 5,900 pounds of cottage cheese, 33,000 pounds of condensed milk, 18,000 pounds of powder, 4,000 pounds of American cheese and 2,500 pounds of butter. Every plant except the one built during 1957 reported major repairs or replacements of equipment.

Some of the major repairs, additions or replacements of equipment made during the past 10 years were:

| Major Repairs or Replacement | Plants |
|---|---|
| Installed new pasteurizers and boilers | 11 |
| Built new cold storage and equipment | 6 |
| Installed new cheese vats | 5 |
| Enlarged warehouse storage space | 4 |
| Made major repairs to plant buildings | 3 |
| Installed new homogenizers | 3 |
| Installed new evaporating and condensing equipment | 3 |
| Installed new refrigeration equipment | 3 |
| Installed complete American cheese equipment | 2 |
| Installed complete butter equipment | 2 |
| Installed new receiving equipment | 3 |
| Replaced all butter, cottage cheese and condensed milk equipment | 1 |

## Volumes and Products Manufactured

Nineteen of the 34 plants surveyed manufactured creamery butter during 1956-57; 14 manufactured cottage cheese, 9 made condensed milk, 6 made American cheese and 4 manufactured powder, Table 3. Some plants made more than one product. The milk products manufactured by those plants during 1956 represent 227 million pounds of fluid milk equivalent and about 270 million pounds during 1957. This represents an overall increase in fluid milk utilization of 19 percent between 1956 and 1957. The estimated volume and percentage increase is based on 28 plants that gave information on total output for 1956 and estimated output for 1957.

The daily manufacturing capacity (based on an 8-hour run) of the 34 plants of all products manufactured is 3.2 million pounds of fluid milk equivalent. However, the total milk equivalent represented by actual output of all the products manufactured during the summer of 1957 was 1.6 million pounds per day. This indicates that, on the average, plants during the summer of 1957 were operating at 49 percent of capacity — adjusted for an 8-hour day. "Capacity" refers to the quantity of product that can be processed during 8 hours of operation; "excess capacity" means that plants are not producing all they are capable of producing during a specific time; they are operating at a fraction of capacity.

Information concerning the number of hours of operation per week was obtained from 31 of the 34 plants surveyed. These 31 plants averaged 51 hours per week—ranging from 8 to 144 hours of operation per week during the summer of 1957. One plant operated only 1 day of 8 hours per week while, at the other extreme, another plant operated 24 hours per day, 6 days per week. Although plant operation averaged 51 hours per week, actual daily output amounted to only 49 percent of capacity—adjusted to an 8-hour day.

For most Texas plants the manufacture and sale of manufactured milk products can be considered supplemental to packaging and distributing fluid milk. Twenty-three of the 34 plants sur-

TABLE 3. PRODUCTION CHARACTERISTICS OF TEXAS DAIRY PRODUCTS PROCESSING PLANTS, SUMMER 1957

| Item | Butter | | American cheese | | Cottage cheese | | Condensed milk | | Powder | | All products |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of plants processing[1] | 19 | | 6 | | 14 | | 9 | | 4 | | |
| | Quantity | No. plants | Quantity | No. plants | Quantity | No. plants | Quantity | No. plants | Quantity | No. plants | All products |
| Capacity per 8-hour period, pounds | 64,600 | 19 | 25,000 | 6 | 43,280 | 14 | 273,890 | 9 | 57,100 | 4 | |
| Actual daily output, pounds[2] | 13,504 | 17 | 31,428 | 6 | 33,956 | 14 | 159,091 | 9 | 24,154 | 3 | |
| Percent capacity operated[3] | 22.0 | 17 | 82.2 | 6 | 61.6 | 14 | 54.5 | 9 | 57.6 | 3 | 48.8 |
| Total milk equivalent represented by capacity, pounds | 1,473,600 | 19 | 250,000 | 6 | 229,870 | 14 | 822,022 | 9 | 472,000 | 4 | 3,247,492 |
| Total milk equivalent represented by actual output, pounds | 307,980 | 17 | 314,275 | 6 | 180,356 | 14 | 477,513 | 9 | 303,213 | 3 | 1,583,339 |
| Range in capacity per 8-hour period, pounds | 600 to 15,000 | 19 | 2,000 to 5,000 | 6 | 80 to 18,000 | 14 | 1,590 to 132,000 | 9 | 9,600 to 19,500 | 4 | |
| Range in actual daily output, pounds[2] | 50 to 2,690 | 17 | 1,000 to 8,300 | 6 | 40 to 11,000 | 14 | 1,060 to 88,000 | 9 | 1,154 to 18,000 | 3 | |
| Estimated output during 1957, pounds | 5,141,000 | 17 | 3,852,800 | 4 | 7,082,681 | 12 | 8,649,000 | 4 | 4,370,000 | 3 | 270,450,158[4] |
| Total output during 1956, pounds | 4,404,930 | 17 | 2,841,369 | 4 | 5,570,601 | 11 | 7,654,152 | 4 | 3,816,250 | 3 | 227,156,554[4] |
| Percent increase estimated | 20.5 | 16 | 35.6 | 4 | 22.5 | 11 | 8.0 | 3 | 14.5 | 3 | 19.1 |

[1]All 34 manufacturing plants in the State were included in the survey. Twelve plants manufactured two or more products and 5 plants produced three or more.

[2]Range and actual output per day may be higher than capacity per 8-hour period in cases where some plants operated an average of more than 8 hours per day.

[3]Adjusted for an 8-hour period.

[4]Pounds of milk equivalent.

veyed are engaged in packaging and distributing fluid milk. This explains why only 24 percent of total daily milk receipts are utilized in the manufacture of milk products. Many plants operate at only fractional capacity during months of low receipts and at full capacity during seasons of flush milk production.

Of the 5 plants under cooperative type of ownership, 3 manufactured two or more products. Three of the 5 plants manufactured powder, 2 made condensed milk, 3 manufactured American cheese and only 1 plant made butter. These plants have a combined capacity of 55,500 pounds of condensed milk, 14,000 pounds of American cheese, 37,100 pounds of powder and 1,000 pounds of butter. This represents a utilization capacity of 730,000 pounds of fluid milk equivalent under cooperative ownership. However, most cooperatively owned plants also are utilized at only fractional capacity with most of their operation occurring during periods of surplus producer milk receipts. Although these plants operated an average of 68 hours per week during the summer of 1957 they turned out only 65 percent of the condensed milk, 33 percent of the butter, 140 percent of the American cheese and 19 percent of the powder that they were capable of producing during an average of 48 hours per week. The high output of American cheese relative to capacity per 8-hour period is accounted for by the fact that 2 of the 3 plants manufacturing this product operated 12 hours per day, 6 days per week during that period.

## Sources, Volume and Price of Milk Supplies

The 34 plants included in this study received a total of 6.7 million pounds of fluid milk per day during the summer of 1957. Of this amount, 3.6 million pounds were received from individual producers, 1.6 million pounds from milk producers' associations and 1.5 million pounds from receiving stations and other plants, Figure 2.

Sources of milk supplies were not obtained from 2 of the 34 plants interviewed. Houston, in Harris county, functions as a receiving point for producer milk obtained from about 2,000 producers in South and East Texas counties. One plant obtained fluid milk and 4 plants obtained powder from sources outside the State.

Some milk producers' associations are becoming more active in controlling the marketable milk of their members. In some areas, producers' associations assume the responsibility for marketing almost all of their members' output while in other areas associations are less active. In some parts of the State, deliveries by producers' associations account for almost 100 percent of the milk received by plants; in other areas deliveries by producers account for most of plant receipts. Interplant receipts, or transfers of milk, occur frequently when some plants are oversupplied with milk while others are in short supply. One plant

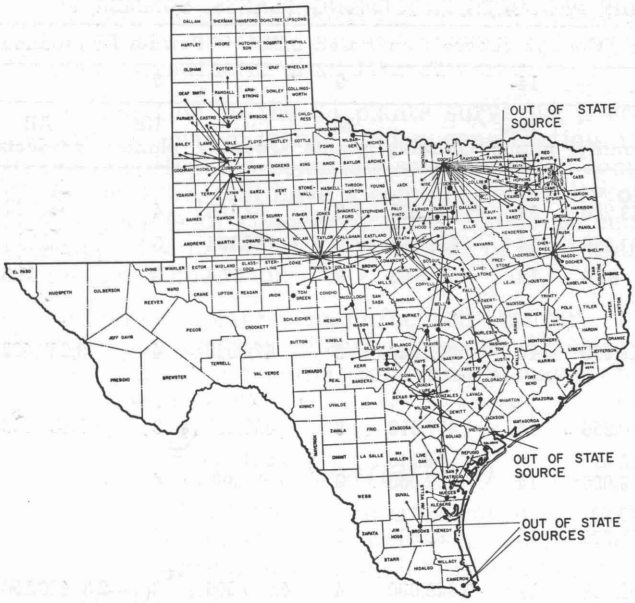


**Figure 2. Source of milk supplies utilized in milk products manufacturing in Texas plants, summer 1957.**

obtained part of its fluid milk supplies directly from producers residing in another state and 4 plants used in their manufacture of dairy products 13,770 pounds of milk powder per day which they obtained from two other states.

Since there are 4 plants in Texas manufacturing 24,000 pounds of milk powder per day, an attempt was made to determine why the plants using powder in their manufacture did not obtain it from Texas milk powder plants. The answer is that the powder manufactured in Texas generally lacks consistency in quality. This may be caused by improper cleaning of equipment during rush periods and excess of capacity utilization when accumulation of large volumes of surplus milk results in improper processing.

This is true with other products also, especially when returned Class I milk during surplus periods is sold or utilized for manufacturing purposes only after it cannot be moved in Grade "A" channels. Specific cases involve managers of American cheese plants who, when pressed for time, remove the cheese from the presses too soon. The equipment is not capable of handling the volume in process; the curd is turned too often and too fast; or the starter may be insufficient, resulting in an inferior product.

### TRANSPORTATION

Fifteen plants transported part of their milk supplies in their own trucks, 19 plants received milk in trucks under contract, 3 received part of their milk by rail and producers transported their own milk to 23 plants. (Most plants received milk by two or more transportation methods.) Two plants used their own trucks to transport 100 percent of their milk supplies and 5 plants received all of their milk in trucks under contract while 2 plants reported that producers delivered 100 percent of the milk received.

Fourteen plants received from 50 to 99 percent of their milk by trucks under contract, 7 in company trucks and 5 reported that producers delivered from 50 to 99 percent of their milk supplies. Four plants received up to 49 percent of their milk by trucks under contract, 6 used company trucks to transport 49 percent of their milk to the plant while 16 stated that producers brought in 49 percent of milk receipts. The 3 plants receiving milk by rail reported such receipts as less than 25 percent of the total.

### BULK AND CAN SHIPMENTS

Twenty plants received milk in bulk. Of these, 5 received 100 percent of their milk supplies in bulk and another 5 received between 50 and 99 percent. Four plants received between 25 and 49 percent of their milk in bulk while 6 received less than 25 percent by that method. One plant has been receiving milk in bulk for more than 10 years and 2 plants have been receiving in bulk 5 to 9 years. Thirteen plants reported receiving bulk milk 1 to 4 years and 4 plants started receiving in bulk less than a year ago.

Handling Grade "A" milk in bulk on Texas dairy farms began during 1953, when bulk tanks were first installed by Grade "A" farmers. Ungraded milk has been transported in bulk to processing plants for more than 10 years. The portion of producer milk handled in bulk ranges from 55 percent of total deliveries in some areas of the State to less than 10 percent in others. Most of the intermarket or interplant transfers of fluid milk and deliveries by producers' associations and receiving stations are transported to the plants in bulk. Generally, milk that is transported to the plants in bulk originates from a greater distance than milk delivered in cans.

Of the milk received directly from producers by plants included in this study, 63 percent was received in cans and 37 percent in bulk. Receiving stations and producers' associations delivered 60 percent of their milk in bulk and 40 percent in cans to plants.

### PRICES PAID

The 15 plants that furnished information on prices paid for Class I milk paid an average of $5.66 per cwt. for this milk. Nineteen plants paid an average of $3.14 per cwt. for Class II and ungraded milk. The average price paid for butterfat was 55 cents per pound by the 12 plants that gave this information while the 4 plants using powder paid an average of $16.87 per cwt. These are prices paid for products delivered at plant.

## *Milk for Manufacturing*

It is difficult to determine accurately the proportion of milk produced by Texas dairymen that is used for manufacturing because of the inter-

TABLE 4. MILK USED IN MANUFACTURING DAIRY PRODUCTS—WHOLE MILK EQUIVALENT BASIS, 1946-56[1]

| Year | Creamery butter | Cheese | Evaporated and condensed milk[2] | Ice cream and frozen products | Other products[3] | Total[4] |
|---|---|---|---|---|---|---|
| | | | Thousand pounds | | | |
| 1946 | 306,652 | 105,150 | 67,975 | 369,431 | 1,256 | 806,651 |
| 1947 | 314,799 | 119,925 | 78,450 | 317,932 | 3,349 | 794,886 |
| 1948 | 227,544 | 82,350 | 59,025 | 288,159 | 4,581 | 627,478 |
| 1949 | 243,170 | 52,725 | 57,850 | 270,772 | 6,233 | 600,586 |
| 1950 | 224,263 | 46,475 | 57,225 | 285,864 | 8,209 | 591,285 |
| 1951 | 124,777 | 32,350 | 42,450 | 319,067 | 10,395 | 497,634 |
| 1952 | 109,598 | 34,900 | 23,625 | 287,114 | 12,791 | 439,315 |
| 1953 | 129,688 | 50,225 | 44,850 | 260,704 | 13,884 | 472,061 |
| 1954 | 121,138 | 47,475 | 31,025 | 252,181 | 16,698 | 442,344 |
| 1955 | 117,522 | 31,250 | 35,125 | 254,045 | 19,651 | 432,220 |
| 1956 | 102,969 | 26,628 | 69,885 | 256,590[5] | 21,000 | 477,072 |

[1]Source: "Production of Manufactured Dairy Products", USDA, AMS, Annual 1948-55.

[2]Includes milk equivalent used in manufacturing unsweetened skimmed condensed and unskimmed evaporated milk.

[3]Includes milk equivalent of dry cream, malted milk powder, dry or concentrated ice-cream mix, creamed cottage cheese and other special milk products.

[4]Duplication removed by making deductions for the amount of fat removed in whey cream and used for making butter and amount of fat removed in making ice cream.

[5]Excludes mellorine type frozen desserts and mix.

state movement of milk supplies. Estimates of the amount of milk used for manufacturing in Texas are shown in Table 4. These indicate that the total volume of such milk declined by 45 percent during the 11-year period of 1946 to 1956. Indications also are that the proportion of the total milk used in making dairy products was 35 percent during 1946 and 25 percent during 1950, but dropped to 19 percent during 1955. The decline in the volume of milk production from 4.2 billion pounds to 3.0 billion pounds that occurred during that 11-year period partly explains this drop, but probably a greater factor is the reduction of from 630 million pounds during 1946 to 227 million pounds during 1954 in the amount of milk used to make farm-churned butter.

The increase of 45 million pounds of whole milk used during 1956 went mainly into increased output of unsweetened condensed milk and reflects an increase in the volume of milk marketed by producers in those areas of surplus producer deliveries.

## Distribution of Manufactured Products

Most of the milk products manufactured by Texas processing plants are sold by processors to consumers and distributors in Texas, with most of the primary sales areas located in the centers of population and counties adjacent to the plant location. Exceptions were found mainly among those plants operating as subsidiaries to large corporations engaged in distributing a multitude of products over wide areas and in several states. For example, one such plant shipped its butter to parent distributors in four adjacent states while some American cheese was moved from Texas to Missouri and California. Some American cheese went to the U. S. Department of Agriculture. These purchases were through the Department's Dallas office. A small amount of cottage cheese was moved into New Mexico.

In the past, New York, Chicago, San Francisco and Los Angeles were considered relatively important markets for dairy products produced in Texas, but at present out-of-state movements are insignificant.

Most of the plants that also engaged in local fluid milk distribution sold most of their manufactured dairy products on their own fluid milk routes or to the stores which handle their fluid milk.

## Production by Type of Product

### BUTTER

The 19 butter processing plants in Texas reported a combined daily manufacturing capacity of 64,600 pounds of butter. Actual production of 17 of those plants during 1956 amounted to 13,504 pounds per day. This indicates that they operated at about 22 percent of capacity, based on an 8-hour basis of operation per day, 6 days per week. The manufacturing capacity of butter plants ranged from 600 to 15,000 pounds while the actual daily output ranged from 50 to 2,690 pounds of butter.

The total production of butter from 17 of the 19 plants amounted to slightly more than 4.4 million pounds during 1956. Estimated output of butter during 1957 was slightly more than 5.1 million pounds, an increase of 20 percent over 1956.

Most plants producing butter in Texas consider the manufacture of that product as incidental to the manufacture of other dairy products, such as American cheese and cottage cheese. Many plants obtain the cream that is manufactured into butter as a residual to powder, condensed and evaporated milk, cottage cheese and American cheese manufacturing. In most plants greater value is placed on and realized from the solids not-fat in the milk than on the fat or cream. In other words, the milk is handled primarily for

the solids not-fat in the milk rather than the butterfat it contains. Managers of 12 of the 19 plants manufacturing butter reported that they also manufactured other milk products. Five of these plants also produced condensed milk, 6 made cottage cheese, 2 manufactured powder and 1 each made American cheese, evaporated milk and concentrated whey. Five of these 19 plants manufactured 2 or more products besides butter and 9 were engaged in activities unrelated to the dairy industry.

### AMERICAN CHEESE

The 6 American cheese manufacturing plants reported a combined capacity of 25,000 pounds of cheese per 8-hour run. These plants had a daily output of 31,428 pounds. However, when adjusted to an 8-hour day these plants were operating at only 82.2 percent of capacity. Plant capacity ranged from 2,000 to 5,000 pounds but actual daily output ranged from 1,000 to 8,300 pounds, indicating that some plants were operating more than the usual 8 hours per day while others were operating at about 50 percent of capacity.

The total 1956 output of 4 of the 6 plants amounted to 2.8 million pounds and estimated production for 1957 was placed at 3.9 million pounds which indicates that plants from which this information was obtained increased output of American cheese during 1957 by about 36 percent compared with 1956 output.

### COTTAGE CHEESE

The 14 plants manufacturing cottage cheese reported a daily capacity of 43,280 pounds. However, these plants actually produced a total of about 34,000 pounds per day which means that they were operating their cottage cheese equipment at slightly more than 61 percent of capacity. Plant capacity ranged from 80 to 18,000 pounds while actual daily output per plant ranged from 40 to 11.000 pounds. Total output during 1956, for 11 plants reporting, amounted to 5.6 million pounds and estimated output for 1957 of 12 plants was 7.1 million pounds. This indicates that during 1957 the total production of cottage cheese by Texas plants was 22 percent more than the amount produced during 1956.

### CONDENSED MILK

The 9 plants manufacturing condensed milk reported a combined daily capacity of 273,890 pounds, but the actual daily production of these 9 plants was 159,091 pounds. These plants operated at 55 percent of capacity. The range in plant capacity was from 1,590 to 132,000 pounds. However, the actual output ranged from 1,060 to 88,000 pounds.

Total production of condensed milk for 1956 was 7.6 million pounds and estimated output for 1957 was 8.6 million pounds. Only 3 plants furnished information for both years and the management personnel indicated an over-all increase of 8 percent in condensed milk production during 1957.

### MILK POWDER

The 4 powder plants reported a total capacity of 57,100 pounds of powder for an 8-hour period. Actual daily production of powder for 3 plants was 24,000 pounds per day. These figures indicate that these plants were operating at 58 percent of capacity based on an 8-hour day. The manufacturing capacity of the powder plants ranged from 9,600 to 19,500 pounds. The range in actual capacity of these plants was from 1,000 to 18,000 pounds of powder per day. The range of output to capacity was from 12 to 100 percent for the three plants which supplied information in both categories.

Total production during 1956 from 3 of the 4 plants manufacturing powder was 3.8 million pounds. The estimated 1957 output of powder was 4.4 million pounds, an increase of half a million pounds, or 15 percent, over 1956.

## *Future Production Plans*

The managers of the manufacturing plants included in this study were questioned about their production plans for 1958 and for the next 5 years and the reasons for future plans.

Fifteen managers reported that they plan to remain at the same level of output during 1958, 14 plan to increase production, 2 indicated that they plan to decrease production in that period and 3 managers did not supply this information. During the next 5 years, 8 plan to remain at the present level of output, 16 plan an increase in production, 1 indicated a decrease in production and 9 managers did not supply this information.

The reasons given for future production plans can be grouped into three categories: optimistic, uncertain and pessimistic. In the first category were such statements as: increased number of sales outlets; population increases forecast; natural desire of management to increase production; operate plant more efficiently and economically; natural increase in production and sales; tight economic times coming with more farmers getting into dairying, thus increasing available supplies of manufacturing milk; plan to enter another phase of milk processing (ice cream).

In the uncertain category were such statements as: depends on supply and demand; cannot be sure of present cream supplies; may handle a greater volume of fluid milk but not manufacture more milk products; labor uncertainty; depends upon producer receipts.

The pessimistic statements included the following: production will not pick up too much; some present cream producers will drop out; very heavy competition for supplies; competition from oleomargarine is increasing while butter is dying

out; marketing orders work against the milk product manufacturers.

In general, industry-side sentiment appeared optimistic about future plans. The pessimistic statements for the most part came mainly from the small manufacturer.

## Processing and Equipment

In addition to the economic data previously discussed, information relative to processing of the various products also was obtained from management personnel. This information gives an indication of the processing equipment and the general condition of plant equipment found in Texas milk product manufacturing plants.

The summary of processing information is presented in three phases: butter processing, cheese manufacturing and evaporated, condensed and dried milk.

### BUTTER

The managers for 14 of the 19 butter processing plants reported that they graded producer's cream used in their manufacture, 4 reported that they did not use graded producer's cream and 1 plant did not furnish this information. However, 17 stated that they made butter from graded cream while 2 did not.

Concerning the method of neutralizing cream, 14 reported neutralizing by calculation, 2 used the automatic process and 3 did not neutralize the cream. Ten plants filter the cream before pasteurization, 3 filter it after pasteurization, 3 filter it before and after while 3 plants do not filter it. Four plants use the stainless steel type of filter, 8 use cloth and 4 use both stainless steel and cloth.

Eight plants pasteurize the cream in coil vats, 4 utilize the flash method, 2 use the flash-and-vacuum method and 1 each utilizes batch pasteurizer, holding method, holding and vacuum, short time and vat with steam circulating in the jacket. Three plants cool the cream in coil vats, 12 in stainless-steel surface coolers while 1 plant each used an aerator and coil vat, tinned surface cooler and coil vat, batch pasteurizer and sweet water and direct expansion. Eleven plants churn the cream in wooden roller churners, 2 use metal churners, while 6 plants churn in wooden rolless churners. Managers of 8 plants reported that the butter they process is printed from Friday boxes and 9 utilize the automatic printing process.

Concerning disposition of buttermilk, managers of 10 plants stated that they used it as hog or other animal feed. 4 sold it as liquid buttermilk. 1 used it in mellorine processing and 4 disposed of it in the sewage disposal system.

### CHEESE

Managers of 16 of the 21 cheese processing plants, including the one under construction, stated they standardize the milk daily for fat, 4 standardize it daily for solids not-fat, 14 do not standardize it for not-fat and 4 do not standardize it for fat. Twelve utilize the high-temperature-short-time method of pasteurizing the milk, 3 employ the flask method and 1 each makes use of the vat method, vat and holding system, batch and plate method. Twelve plants are equipped to cool the milk by the regeneration system, 7 have stainless-steel surface coolers and the other 2 plants use vat cooling.

Stainless-steel vats are used to make cheese by 20 managers. The curd is cooked by circulating hot water in jackets in 11 plants, by use of low-pressure steam in 9 plants and by live steam into water in 1 plant. Nine plants mechanically agitate the curd during cooking, 8 stir it by hand, while 4 utilize both hand and mechanical agitation. Of the 6 American cheese plants, 3 use round-type hoops, 1 uses both round and rectangular hoops while 1 uses steel barrels and 1 did not furnish this information.

Most cottage cheese processors pack this product in packages weighing less than 1 pound while a few market it in packages of 5 pounds or over. The 12-ounce package, utilized by 9 processors, was the size mentioned most frequently.

Thirteen cheese plant managers store their product under high refrigeration, 4 store it under both temperature and humidity controlled conditions and 1 uses low refrigeration. Concerning disposal of the whey, 13 processors dispose it as sewage, 5 reported utilizing it as liquid animal feed and 2 stated they condensed or dried it before selling it as animal feed.

### CONDENSED, DRIED AND EVAPORATED MILK

Managers of 11 of the 16 plants processing condensed, dried or evaporated milk reported making intake tests of the milk for odor and flavor, 10 made sediment tests, 10 took bacteriological tests, 3 took temperature tests and 2 took acidity tests of the milk before processing it. Four reported standardizing the milk when necessary by adding cream, 3 by removing cream, 4 by adding skim milk, 1 by removing skim milk and 6 stated that they never standardize the milk utilized in their processing.

Milk is forewarmed in stainless-steel hot wells in 7 plants, in stainless-steel forewarmers in 3 plants, while in 2 plants it is forewarmed by the use of plates and in another by the high-temperature-short-time method.

Eight plant managers reported that they did not homogenize their condensed milk but the 2 that did homogenize used stainless-steel block homogenizers. Five dried the condensed milk in spray-type dryers, 1 utilized a vacuum-type drier and another plant manager reported using plate coolers. The finished products ( powder and evap-

orated milk) were stored under atmospheric conditions in the 4 plants which furnished information on storage.

## Acknowledgments

Appreciation is expressed to the management personnel of the 34 dairy products processing plants for their cooperation in furnishing part of the information used in this study. Appreciation is expressed also to the Texas Milk Producers Federation and the several milk producers' associations in Texas for their contribution of data.

This study was made under the Texas Agricultural Experiment Station's State Contributing Project to the Southern Regional Dairy Marketing Project Number SM-10, "Adopting the Market Structure for Milk and Dairy Products to Changing Supply and Demand Conditions in the South."